

# **Fifth Annual Conference on Carbon Capture & Sequestration**

*Steps Toward Deployment*

*Regulatory Analysis Session*

## **Regulatory Considerations for Geologic Sequestration of Carbon Dioxide**

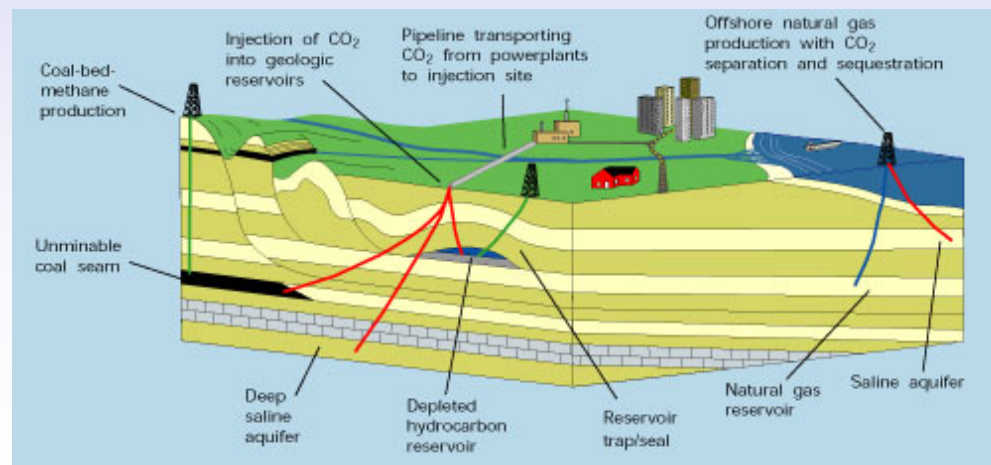
**Michel J. Paque – GWPC Executive Director**

May 8-11, 2006 • Hilton Alexandria Mark Center • Alexandria, Virginia



# The Ground Water Protection Council

- Formed in 1983, the GWPC is the national association of state ground water and underground injection control agencies.
  - *Protection and conservation of ground water resources for all beneficial uses*
  - *Safest methods and most effective regulations regarding comprehensive ground water protection and underground injection techniques*



# **CO<sub>2</sub> Injection is Already Occurring and Will Soon Increase With Geologic Sequestration**

- Within a few years, the universe of CO<sub>2</sub> injection wells will dramatically increase with the advent of CO<sub>2</sub> geologic sequestration
- DOE has scheduled 20+ Phase II Pilot Projects to begin over the next year.



# Developing Regulatory Options

- State and Federal agencies historically have taken years to develop and implement new or modify existing authorities and regulations
- This process typically involves two stages: with Federal development followed by State development and implementation
- Comprehensive coordination and early State involvement can reduce the time for development and implementation



# What Are Some Concerns About CO<sub>2</sub> Geologic Sequestration?

- Regulators and injectors have discussed their experience with CO<sub>2</sub> geologic sequestration. Challenges include:
  - Lower density = greater buoyancy of injectate
  - Reaction with water to form acid
  - Geochemical changes within the receiving formation
  - Damaging effects on cement and metal
  - Keeping CO<sub>2</sub> in desired formations for a sustained time
  - Massive scope of the proposed CO<sub>2</sub> geologic sequestration
- There is no single dedicated regulatory program for CO<sub>2</sub> geologic sequestration.



# Regulatory Considerations for CO<sub>2</sub> Geologic Sequestration

- Siting
  - Geology of injection formation and overlying formations
  - Reservoir pressure profiles and other characteristics
  - Appropriate area of review (well bores, faults, or vertical conduits)
- Well construction
  - Corrosion resistant pipes, casing, and cement
  - Number of casing strings
- Operations
  - Maximum injection pressure (above or below fracture pressure)
  - Injection rate and volume
  - Interactions between injectate, formations, and formation fluids
  - Injection for sequestration/storage vs. use for EOR



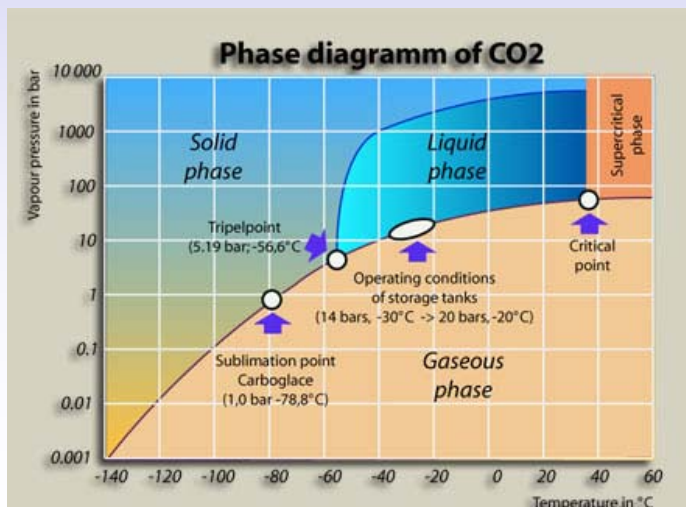
# Regulatory Considerations for CO<sub>2</sub> Geologic Sequestration (cont).

- Monitoring
  - Mechanical integrity testing
  - How to monitor sequestration area
- Closure
  - Plugging and securing
  - Long term issues
  - Financial assurance
- Legal/Policy
  - Ownership interests in wells, pore spaces, and fluids
  - Long-term maintenance and liability
  - Length of time that CO<sub>2</sub> must be sequestered underground
  - Credit for CO<sub>2</sub> capture/removal from atmosphere
  - Appropriateness of current statutory and regulatory authorities



# Regulatory Discussions Should Address Questions Such As:

- What changes in receiving reservoirs are acceptable?
  - Desalination is now used to treat brine aquifers considered completely unusable for drinking water 10 years ago
- How much CO<sub>2</sub> escape is acceptable?
- What other constituents will be acceptable in the CO<sub>2</sub> injectate?
- What other chemicals may be generated in the formations and in ground water as a result of CO<sub>2</sub> injection?





# Consideration of Potential Regulatory Programs

- Look at existing regulatory programs regarding CO<sub>2</sub>
  - How will they protect USDWs?
  - How will they protect human health and the environment?
  - How will they prevent or control CO<sub>2</sub> releases to the atmosphere?
  - Can we adapt existing laws to adequately regulate CO<sub>2</sub> sequestration?
    - Apply reasonable, but not necessarily identical requirements to sequestration/storage wells
    - Weigh overall environmental risks and benefits



# Oversight Options for CO<sub>2</sub> Geologic Sequestration

- U.S. EPA
  - Office of Water
    - UIC program
    - New CO<sub>2</sub> program?
  - Office of Air (emission reduction, credit and trading)
- State agencies
  - Environmental
    - Water, public health, air, other
  - Oil and gas
  - Shared Oversight
- Blended combinations
  - Allocation of responsibility by several state and/or federal agencies



# Potential CO<sub>2</sub> Geologic Sequestration Program Stakeholders

- Follow iterative and deliberative process
- Allow for flexibility, innovation, and adaptation
- Provide broad expert participation
- Engage Major Stakeholder Groups

States

US EPA

US DOE

Regional Partnerships

NGOs

Industry



# Moving Forward

- GWPC January 2006 UIC Conference
- World Resources Institute Stakeholder Process
- Site Characterization Conference
- GWPC Annual Policy Conference Session
- EPA CO2 Workshop at GWPC 2005 Annual Forum
- GWPC Class I Division
- GWPC Workgroup for state input into USEPA Guidelines
- Preliminary Legal Analysis of Geo-Seq/UIC
- Well Class Scheme and Targeted Primacy for state regulators



# GWPC Participation in CO<sub>2</sub> Geologic Sequestration Regulatory Development

- GWPC provides a respected forum for communication and research on ground water protection and underground injection issues
- GWPC's goal is to support fair and effective regulatory development for CO<sub>2</sub> sequestration



# GWPC Resolution

- RESOLUTION 06-1 - REGARDING THE GEOSEQUESTRATION OF CARBON DIOXIDE

THEREFORE BE IT RESOLVED THAT,

- 1. the GWPC shall work with the states and other stakeholders to ensure the protection of ground water while facilitating the underground injection of carbon dioxide; and
- 2. the GWPC invites the USEPA to work with state Underground Injection Control regulatory agencies in implementing a regulatory program for the practice of underground injection of carbon dioxide.



# Conclusions

- CO<sub>2</sub> geologic sequestration is likely to expand significantly over the next few decades
- Existing federal and state regulatory programs were not specifically designed to accommodate the large volume and unique characteristics of CO<sub>2</sub> geologic sequestration
- Regulatory modifications may be appropriate to allow sufficient flexibility to encourage innovation and adaptation
- States have decades of extensive experience regulating diverse underground injection disposal and storage activities while protecting ground water resources
- State and federal partners need to complete the regulatory process in a timely fashion to satisfy the need for geologic sequestration
- States should be equal partners and have primary oversight



# Ground Water **GWPC** Protection Council

[www.gwpc.org](http://www.gwpc.org)

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